The (soon forgotten) art of open stone surgery: to train or not to train?

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ABSTRACT To date, open stone surgery is now performed in a very limited number of selected cases. A review of our own cases revealed that open surgery constituted 1% of all procedures. These procedures were mostly ablative, or operations to deal with complications of failed minimally invasive therapies. Given two continuing trends towards sub-specialisation in urology on the one hand, and minimally invasive therapy on the other, the question arises whether and how sub-specialised stone surgeons should and can learn open stone surgery. Is it merely a lost art not to be bothered with, or is it something worthwhile preserving? This article discusses the pros and cons of the argument and suggests centralisation of complex stone cases as a possible way out of the dilemma.

KEYWORDS

Open surgery – Stone surgery – Urology training – Surgical training

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Surgical management of urolithiasis, in particular cystolithiasis, has been known for more than two millennia. The term lithotomy was first used by the Greek surgeon Ammonius (276 BC), but the practice of cutting the stone would have existed long before that. However, Hippocrates (460 BC) discouraged the procedure. His oath reads: 'I will not cut persons labouring under the stone, but will leave this to be done by practitioners of this work'. Most probably, he wished to disassociate himself from this frequently unsuccessful procedure, in an attempt to prevent it from tarnishing the physicians' reputation.

The Roman physician Celsus (25 BC–25 AD) provided the earliest proper description of a lithotomy procedure for bladder stones. Notably, his description remained broadly accurate for the techniques used over the next 1500 years. The procedure remained associated with a relatively poor success rate with frequent and often unpleasant complications, such as damage to the rectum or bladder, and death.

Only over the last 150 years, with the techniques of asepsis and anaesthesia, has more complex surgery become possible. For almost all stones in the urinary tract, open surgical procedures have been developed and applied. The invention of cystoscopy allowed for endoscopic removal of bladder stones.

Then, over the last three decades, the development of endourological and non-surgical less-invasive techniques,

such as extracorporeal shock wave lithotripsy (SWL), percutaneous nephrolithotomy (PCNL), ureterorenoscopy (URS), and – more recently – laparoscopy have revolutionised stone treatment and led to a marked decrease in the need for open stone surgery.^{1,2} Thus, endourology, comprising most minimally invasive urological procedures, has become a major sub-specialty within urology. In the UK, more and more dedicated endourologists are sought to run stone services and minimally invasive treatment units, and teach juniors in those sub-specialty skills.

We are soon entering an age where a new generation of sub-specialty trained urologists will emerge. In endourology, these will be highly trained individuals mastering all types of complex endoscopic and laparoscopic techniques. However, they most probably will neither have the opportunity nor the skills to perform open urological procedures. Although open stone surgery has become a rare event, the literature suggests that it still retains a place in selected cases.

This raises a lot of questions. Will we be able to manage all of these cases in future in a minimally invasive fashion? Or shall we leave those selected cases to urologists with experience in open surgery – but not necessarily in stone surgery? What exactly is the role of open stone surgery to date? Is it still necessary to train endourologists in open stone surgery? And how could we go about it given the rarity of this type of surgery?

This article will attempt to elucidate the role of open stone surgery to date based on our current data, and to discuss the resulting training issues.

Patients and method

Data on patient throughput and operative procedures performed were obtained for all in- and out-patients surgically treated by the stone service of Barts and The London NHS Trust, London, UK between June 2002 and December 2003. Data on open surgical procedures were extracted and compared to the overall data. Comparison to other centres and discussion of resulting training issues were done on the basis of extensive literature research.

Results

In the time period studied, 1152 stone patients were surgically treated by our service; thereof 912 by SWL and 240 patients underwent minimally invasive, endourological surgery other than SWL. Of these 240 procedures, 13 were open procedures (Table 1). All but one were performed as elective surgery, either as primary indications or for repair of previous complications. One emergency nephrectomy was needed in a patient who developed severe renal bleeding 10 days after percutaneous nephrolithotomy (PCNL).

Thus, without yet taking into account the recent shift towards laparoscopic urological indications, open surgery constituted 1% of all patients undergoing surgical procedures in the service in the time period studied, or 5% of all patients undergoing endo-urological procedures if we exclude SWL.

Discussion

The current role of open stone surgery

A decade ago, the rate of open stone surgery was reported as 26% in a tertiary referral centre in Pakistan,³ and 3–5% in the

US.^{2,4} More recently, this rate has dropped to 8% in Pakistan,⁵ and 0.7–2% in centres of the so-called industrialised world.^{5–7} Whereas minimally invasive technology may not be as readily available in non-industrialised countries, the trend worldwide becomes clear: a dramatic reduction in open stone surgery with a simultaneous increase in less invasive procedures such as SWL, PCNL, URS, and laparoscopy.¹

Indications nowadays for open stone surgery can be complex stone disease,^{2,5–7} concomitant anatomical abnormalities such as pelvi-ureteric junction (PUJ) obstruction, infundibular stenosis or calyceal diverticulum,^{2,5–7} failure of minimally invasive treatments,^{2,4,5,7} morbid obesity,^{2,4,7} comorbid medical diseases,^{2,7,8} concurrent open surgery,^{2,4,7,9} renal transplantation,⁴ severe limb contractures,⁴ and patient preference.⁷ However, with improving expertise, many sub-specialised stone centres may increasingly accept these patients for minimally invasive treatment too.

As mentioned above, non-industrialised countries have a slightly different situation with 8–14% of open stone surgery to date.^{3,10} Factors responsible are: (i) unavailability of equipment for non-invasive and minimally invasive techniques; (ii) increased emphasis on cost (which is born at least in part by the patient) and the consequent desire for a single procedure; and (iii) later presentation and, therefore, more complex cases. In the light of these limiting factors, open stone surgery will probably remain a viable option in those countries for some time.⁵

With 1% of open surgery in the stone service, our data, therefore, compare with the literature.

The future

The trend towards minimally-invasive and endourological procedures is expected to continue. Further improvements in technology and expertise will widen the spectrum of indications. Traditional indications for open stone surgery may have to be re-defined. A good example for these new techniques is the rapid advent of laparoscopy in urology in

Table 1 Open procedures June 2002 to December 2003

Procedure	Reason	Number
Nephrectomy (emergency)	Severe renal bleeding 10 days after PCNL	1
Nephrectomy	Non-functioning stone bearing kidneys	7
Psoas hitch	Total distal ureter occlusion after previous SWL and URS (2)	2
Boari plasty	6-cm lesion distal ureter	1
Pyeloplasty	Aberrant renal artery on CT (1) and unilateral functioning horseshoe kidney with extreme narrow PUJ (1)	2
Total		13

PCNL, percutaneous nephrolithotomy; SWL, extracorporeal shock wave lithotripsy; URS, ureterorenoscopy; CT, computer tomogram; PUJ, pelvi-ureteric junction.

recent years. With the introduction of laparoscopic nephrectomy, pyeloplasty and ureterolithotomy, the rate of open surgery in our service is expected to drop well below the 1% mark in the near future.

With minimally invasive procedures being *en vogue*, the attitude of both, patients and surgeons, may play a determining role here too. For the patient, the ever more common experience of 'keyhole surgery' may well provoke certain expectations. Increasingly, patients are extremely well informed about their condition and its management. The benefits of minimally invasive surgery – reduced pain and faster recovery – are well publicised, particularly on the Internet. Often, there is the perception that minimally invasive techniques are more 'high-tech' than open procedures. Consequently, a patient might be reluctant to undergo an open procedure when minimally invasive options are available.

From the surgeons' perspective, similar pressures may apply. There is a suggestion that, since its role now appears so limited, open surgery is considered a 'sign of failure'.¹¹ The surgeon may, therefore, choose minimally invasive techniques even in cases where open surgery might be a valid option.

Open stone surgery will further decrease. However, though reserved for selected cases only, it will not entirely disappear in the foreseeable future.

To train or not to train?

At present, the Joint Committee for Higher Surgical Training (JCHST), via its Specialist Advisory Committee (SAC) in urology, recommends that trainees should have knowledge and experience in 'the surgical treatment of renal calculi including PCNL and open surgery',¹² and that trainees subspecialising in endourology should be assessed for competence in open stone surgery.¹⁵

Open stone surgery, to date, constitutes a small number of selected cases likely to decline further. Is it really still necessary, justifiable or possible to continue to teach open stone surgery to trainee urologists/stone specialists?

The case against

The role of open stone surgery is already limited and likely to decrease further. This presents some practical obstacles to training. To continue training would, therefore, be both unnecessary and impractical.

Would trainees be exposed to sufficient open procedures to attain an acceptable standard of competence? In a tertiary referral centre in the US, only seven open procedures were performed in a 2.5-year period.⁵ Likewise, in our own centre, only 13 open stone related procedures were performed in 1.5 years. If these are signs of things to come, surely it will be impossible to provide appropriate training for future urological stone surgeons.

Furthermore, quite apart from practical difficulties in training, would enthusiasm for open procedures remain? It

is too often the case that activities in which an individual perceives performance to be weak tend to be disliked. In the absence of opportunities to improve their skills, will the new consultant urologist wish to avoid performing open procedures? The new generation of urologists, for whom operating via a TV screen is the norm, may prefer to use their skills in minimally invasive techniques, rather than perform a relatively alien open procedure. This situation would surely self-perpetuate.

The small number of cases in which open surgery is indicated will still be served for some time by the current generation of surgeons proficient in open stone surgery. Promise is shown in the laparoscopic techniques, and this may well lead to a time where all stones can be adequately managed by non-invasive and minimally invasive procedures. To train surgeons inadequately in a procedure they are unlikely to use can, therefore, be regarded as a waste of valuable learning time.

The case for

One might argue that open stone surgery remains an effective treatment in a selected group of patients. The medical profession, therefore, has a responsibility to preserve all valid options for treatment as long as a treatment has not been proven to be obsolete.

If open stone surgery were no longer taught, would it become a lost art? It seems hard to imagine that anything could become a lost art these days, with such extensive recordings in written, audiovisual or electronic form including interactive and virtual reality simulations. Skills, therefore, could presumably be quickly re-learned in the future if necessary. But is this really the case? It is quite probable that the Romans also considered themselves highly sophisticated, and yet the art of concrete making was lost for over a thousand years after the fall of their empire. Within medicine, physicians of the recent past complained bitterly that the art of clinical examination has, in many ways, been lost. It is unlikely that examination skills, once an integral and essential part of medicine, will ever become re-established in the presence of high-tech diagnostic tools readily available, despite their undoubted usefulness.

What would be the implications of abandoning open stone surgery? First, an effective treatment that has stood the test of time would be removed. Second, open procedures as a basis for future developments would no longer be available. Do we not have a responsibility to pass on skills in case they may be of use to future generations? It is arguably a fundamental characteristic of human society and a central factor in the advancement of the human race that elders pass on their skills and knowledge to younger generations. Indeed, it is quite possibly the evolutionary justification for the survival of humans long beyond their reproductive prime.

A compromise

One could counter the last part of the discussion with a natural extension of its own argument. For maximal advancement, it would be a responsibility of teachers not to pass on every shred of knowledge and skills, but to filter it effectively and deliver only what would be beneficial. To flood students with material they are unlikely to use is not only a waste of time, but probably counterproductive. Also, as demonstrated above, there are some clear practical difficulties to the effective delivery of those skills. These points seem to favour the abandonment of open stone surgery training.

However, it is also likely that the need for open procedures will remain, at least for the foreseeable future. Although this is the case for a relatively small and decreasing number of patients, it is at present unclear whether this proportion will eventually disappear. In view of this, it would seem wrong to withdraw a treatment option at this point in time.

The practical difficulties presented previously are not insurmountable. It should be possible to generate both the resources and enthusiasm to maintain training in a selected number of trainee urologists. This might best be achieved by centralising the patients likely to require open surgery to just a few institutions. Rather than being designated 'open surgery' centres, these institutions would perhaps accept the more complex stone cases and, having at their disposal the full range of treatment options, decide on the best course of management. This may or may not be open surgery, but whatever the treatment in individual cases, the overall profile would contain a higher proportion of open cases than is currently found in most urology departments.

In addition to the training role, the centres would also allow co-ordinated research into the management of these complex cases, achieving greater statistical power than

would be possible in single institution studies. With time, open stone surgery may finally cease to be practised, but we have not reached that point yet.

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